FORM PTO-1390 (REV. 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
2936-0145P	
U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	
10/069383	
INTERNATIONAL APPLICATION NO.	**INTERNATIONAL FILING DATE**
PCT/JP00/04804	July 17, 2000
PRIORITY DATE CLAIMED	
July 19, 1999	

TITLE OF INVENTION

VACUUM CLEANER

APPLICANT(S) FOR DO/EO/US

MATSUMOTO, Yukimichi; OTA, Hiroshi; INOUE, Teruhisa

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau. WO 01/05291
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is transmitted herewith.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4)
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 20. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form PTO-1449(s), and International Search Report (PCT/ISA/210) with 22 cited document(s).
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
    1.) PCT Substitute Claims Letter w/ PCT/IPEA/409 and amended claims w/ translation of amended claims
    2.) Fifteen (15) sheets of Formal Drawings

JC13 Rec'd PCT/PTO 18 JAN 2002

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
10/031383	PCT/JP00/04804	2936-0145P

21. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1,040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $740.00		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 0	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	16 - 20 =	0	X **$18.00**	$ 0	
Independent Claims	2 - 3 =	0	X **$84.00**	$ 0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		None	+ **$280.00**	$ 0	
		TOTAL OF ABOVE CALCULATIONS =		$ 890.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				$ 0	
		SUBTOTAL =		$ 890.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐20 ☐30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$ 0	
		TOTAL NATIONAL FEE =		$ 890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$ 40.00	
		TOTAL FEES ENCLOSED =		$ 930.00	
				Amount to be: refunded	$
				charged	$

a. ☒ A check in the amount of $ **930.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account. No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-2448.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:
Birch, Stewart, Kolasch & Birch, LLP or Customer No. 2292
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Date: January 18, 2002

By _____
Raymond C. Stewart, #21,066

/cgc

PATENT
2936-0145P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant:	MATSUMOTO, Yukimichi et al.		
Int'l. Appl. No.:	PCT/JP00/04804		
Appl. No.:	New	Group:	
Filed:	January 18, 2002	Examiner:	
For:	VACUUM CLEANER		

PRELIMINARY AMENDMENT

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

January 18, 2002

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/JP00/04804 which has an International filing date of July 17, 2000, which designated the United States of America.--

IN THE CLAIMS:

Please cancel claims 1 through 15 without prejudice or disclaimer of the subject matter contained therein.

Please add the following claims:

--16. (New) A vacuum cleaner comprising a suction port body having a suction port, an electric blower for generating suction air, a connection pipe connected to the suction port body, and a cyclone type dust collecting part, disposed between the suction port body and the electric blower, for separating dust by forming the introduced suction air into a whirling stream and collecting the separated dust in a dust collecting chamber arranged in a suction air passage,

wherein a suction air guide is provided that comprises a cylindrical portion substantially cylindrical in shape which is fitted on a top portion of the dust collecting chamber and which has an exhaust portion formed so as to protrude from a center of a ceiling surface thereof into the dust collecting chamber, a connoting portion that is connected to the connectin pipe, and a flow-in portion that couples the cylindrical portion and the connecting portion together so as to permit dust to be introduced tangentially to the dust collecting chamber.

17. (New) A vacuum clenaer as claimed in claim 16,

wherein the exhaust portion is arranged substantially perpendicularly to the flow-in portion, and a filter is provided in an exhaust port formed in a peripheral surface of the exhaust portion.

18. (New) A vacuum cleaner as clained in claim 16,

wherein the cyclone type dust collecting part is arranged substantially parallel to the connection pipe, and part of the connection pipe is bent so as to form a handle part that runs along a peripheral surface of the cyclone type dust collecting part with a gap secured in between that permits insertion of fingers of a user.

19. (New) A vacuum cleaner as claimed in claim 16,

wherein the electric blower and the cyclone type dust collecting part are so arranged as to communicate with each other through a flexible communicating pipe.

20. (New) A vacuum cleaner comprising a suction port body having a suction port, an electric blower for generating suction air, a connection pipe connected to the suction port body, and a cyclone type dust collecting part, disposed between the suction port body and the electric blower, for forming the suction air introduced through a flow-in port into a whirling stream so as to

separate dust and then discharging the suction air through an exhaust port,

wherein the cyclone type dust collecting part has a first dust collecting chamber and a second dust collecting chamber, both cylindrical in shape, for accommodating the separated dust, the first and second dust collecting chambers being arranged side by side along an axis thereof and separated from each other by a partition wall having an opening part formed therein.

21. (New) A vacuum cleaner as claimed in claim 20,

wherein a suction air guide is provided that comprises a cylindrical portion substantially cylindrical in shape which is fitted on a top portion of the first dust collecting chamber and which has an exhaust portion formed so as to protrude from a center of a ceiling surface thereof into the first dust collecting chamber, a connoting portion that is connected to the connection pipe, and a flow-in portion that couples the cylindrical portion and the connecting portion together so as to permit dust to be introduced tangentially to the first dust collecting chamber.

22. (New) A vacuum cleaner as claimed in claim 21,

wherein the first dust collecting chamber is arranged within a suction air passage of the cyclone type dust collecting part, and the second dust collecting chamber is arranged outside the suction air passage of the cyclone type dust collecting part.

23. (Amended) A vacuum cleaner as claimed in claim 21,

wherein the first and second dust collecting chambers are arranged so as to be detachable from the cyclone type dust collecting part.

24. (New) A vacuum cleaner as claimed in claim 21,

wherein at least part of the first and second dust collecting chambers is formed out of a transparent member that permits an inside to be viewed from outside.

25. (New) A vacuum cleaner as claimed in claim 21,

wherein a valve for closing the flow-in port when the electric blower is at rest is provided.

26. (New) A vacuum cleaner as claimed in claim 21,

wherein the exhaust portion is arranged substantially perpendicularly to the flow-in portion, and a filter is provided in the exhaust port formed in a peripheral surface of the exhaust portion.

27. (New) A vacuum cleaner as claimed in claim 21,

wherein the exhaust port is provided in a cylindrical surface of an inner cylinder that is slidable inside an outer cylinder that is provided so as to protrude into the first dust collecting chamber, and, when the exhaust port is clogged, the

exhaust port is covered by the outer cylinder under a suction force of the electric blower.

28. (New) A vacuum cleaner as claimed in claim 21,

wherein a pressure sensor for detecting a pressure difference between in a suction air passage of the cyclone type dust collecting part and in an exhaust passage for the suction ai exhausted through the exhaust port is provided.

29. (New) A vacuum cleaner as claimed in claim 21,

wherein the cyclone type dust collecting part is arranged substantially parallel to the connection pipe and on a side of the connection pipe opposite to a floor surface, and the opening part is provided away from the connecting pipe.

30. (New) A vacuum cleaner as claimed in claim 21,

wherein the cyclone type dust collecting part is arranged substantially parallel to the connecting pipe, and part of the connection pipe is bent so as to form a handle part to be held by a user during cleaning.

31. (New) A vacuum cleaner as claimed in claim 21,

wherein the electric blower and the cyclone type dust collecting part are so arranged as to communicate with each other through a flexible communicating pipe.--

REMARKS

The specification has been amended to provide a cross-reference to the previously filed International Application.

Claims 16 through 31 are pending in the present application. Claims 1 thorugh 15 have been cancelled, and claims 16 through 31 have been added.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
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RCS/cqc
2936-0145P

(Rev. 11/13/01)

14 prts

SPECIFICATION

VACUUM CLEANER

Technical field

The present invention relates to a vacuum cleaner having a cyclone dust collecting part that separates dust and dirt by forming suction air into a whirling stream.

Background art

Conventional examples of vacuum cleaners having a cyclone dust collecting part that separates dust and dirt (hereinafter simply "dust") by forming suction air into a whirling stream are disclosed in Japanese Utility Model Registered No. 2583345 and Japanese Patent Application Laid-Open No. H10-85159. According to these publications, a connection pipe that is connected, at one end, to a suction port body having a suction port is coupled, at the other end, to a cyclone dust collecting part. The cyclone dust collecting part communicates, through a suction hose, with the body of the vacuum cleaner.

Fig. 26 shows a sectional view, as seen from the side, of the cyclone dust collecting part, and Fig. 27 shows a sectional view taken along line A-A shown in Fig. 26. The suction air produced by an electric blower passes through a connection pipe 50 and flows into the cyclone dust collecting part 51 through a flow-in port 51a. The suction air, as it passes through a helical passage 51b formed inside the cyclone dust collecting part 51, is formed into a whirling stream. As the suction air swirls, under centrifugal force, the dust contained therein collides with a wall surface 53a of an inner cylinder part 53, with the result that the dust falls, along a conical part 53c provided in the inner cylinder part 53, into a dust collecting

chamber 55.

The suction air having dust separated therefrom is exhausted through an exhaust port 51c and is fed to a body (not shown) of the vacuum cleaner. In this way, the dust collecting chamber 55 for accommodating dust is provided in the cyclone dust collecting part 51, which is integral with the connection pipe 50. This helps miniaturize the vacuum cleaner and enhance the operability thereof.

However, in the conventional vacuum cleaner described above, the suction passage that runs from the helical passage 51b through the exhaust port 51c is separated from the dust collecting chamber 55 by the conical part 53c. As a result, the dust collecting chamber 55 arranged below the conical part 53c and the suction passage make the cyclone dust collecting part 51 unduly large, spoiling the operability of the vacuum cleaner when the aforementioned suction port body thereof is moved around.

Moreover, inside the dust collecting chamber 55, fine and coarse particles of dust are collected in a mixed manner. This leads to problems like, when the dust collected in the dust collecting chamber 55 is disposed of, fine particles thereof rising into the air and making the surroundings dirty, and such fine particles of dust evading through the exhaust port 51c and damaging the electric blower.

These problems can be solved by providing a dust container inside the body of the vacuum cleaner and permitting fine particles of dust to evade through the exhaust port 51c so that they are filtered out by the dust container. However, this method requires that the body of the vacuum cleaner be made larger, and in addition requires that the refuse collected in the dust container be disposed of, which spoils the operability of the vacuum cleaner when the refuse is disposed of.

Disclosure of the invention

An object of the present invention is to provide a vacuum cleaner that has a miniaturized cyclone dust collecting part but that nevertheless offers improved operability when refuse is disposed of and that is less prone to failure in the electric blower thereof.

To achieve the above object, according to the present invention, a vacuum cleaner is provided with a suction port body having a suction port, an electric blower for generating suction air, a connection pipe connected to the suction port body, and a cyclone type dust collecting part, disposed between the suction port body and the electric blower, for forming the introduced suction air into a whirling stream so as to separate dust. Here, a dust collecting chamber for accommodating the separated dust is provided within a suction air passage of the cyclone type dust collecting part.

In this structure, the suction air produced by the electric blower and introduced through a flow-in port flows through the connection pipe into the cyclone type dust collecting part. Inside the cyclone type dust collecting part, as the suction air flows in the form of a whirling stream, dust is separated therefrom, and the dust is accommodated in the dust collecting chamber. The suction air having dust separated therefrom passes through the dust collecting chamber, and is then exhausted by being sucked by the electric blower.

Alternatively, according to the present invention, a vacuum cleaner is provided with a suction port body having a suction port, an electric blower for generating suction air, a connection pipe connected to the suction port body, and a cyclone type dust collecting part, disposed between the suction port body and the electric blower, for forming the suction air introduced through a flow-in port into a whirling stream so as to separate dust and then discharging the suction air through an exhaust port. Here, a first dust collecting chamber and a second dust collecting chamber for accommodating the separated dust are provided in the

cyclone type dust collecting part. The first and second dust collecting chambers are separated from each other by a partition wall having an opening part formed therein.

In this structure, the suction air produced by the electric blower and introduced through the flow-in port flows through the connection pipe into the cyclone type dust collecting part. Inside the cyclone type dust collecting part, as the suction air flows in the form of a whirling stream, dust is separated therefrom. Larger particles of the dust are blocked by the partition wall and are accommodated in the first dust collecting chamber; smaller particles of the dust are permitted through through holes and are accommodated in the second dust collecting chamber. The suction air having dust separated therefrom is exhausted by being sucked by the electric blower.

According to the present invention, in the vacuum cleaner structured as described above, it is possible to arrange the first dust collecting chamber within the suction air passage of the cyclone type dust collecting part and the second dust collecting chamber outside the suction air passage of the cyclone type dust collecting part. In this structure, the suction air having dust separated therefrom passes through the first dust collecting chamber and is then exhausted by being sucked by the electric blower. Meanwhile, the dust collected in the second dust collecting chamber is prevented from being mixed with the suction air again and exhausted together through the exhaust port.

According to the present invention, in the vacuum cleaner structured as described above, the first and second dust collecting chambers may be arranged so as to be detachable from the cyclone type dust collecting part. In this structure, refuse is disposed of with the first and second dust collecting chambers detached from the cyclone type dust collecting part.

According to the present invention, in the vacuum cleaner structured as described above, at least part of the first and second dust collecting chambers may be formed out of a

transparent member that permits an inside to be viewed from outside. In this structure, the amount of dust collected in the first and second dust collecting chambers can be visually checked from outside.

According to the present invention, in the vacuum cleaner structured as described above, a valve for closing the flow-in port when the electric blower is at rest may be provided. In this structure, even when the electric blower is at rest, backflow of the collected dust is prevented.

According to the present invention, in the vacuum cleaner structured as described above, the exhaust port may be provided in the cylindrical surface of an inner cylinder that is slidable inside an outer cylinder that is provided so as to protrude into the first dust collecting chamber so that, when the exhaust port is clogged, the exhaust port is covered by the outer cylinder under the suction force of the electric blower. In this structure, when the exhaust port is clogged, the inner cylinder is sucked into the outer cylinder under vacuum pressure, so that the exhaust port is covered by the outer cylinder

According to the present invention, in the vacuum cleaner structured as described above, a pressure sensor for detecting the pressure difference between in the suction air passage of the cyclone type dust collecting part and in the exhaust passage for the suction air exhausted through the exhaust port may be provided. In this structure, when the pressure difference between on the upstream and downstream sides of the exhaust port reaches a predetermined level, the exhaust port is detected being clogged.

According to the present invention, in the vacuum cleaner structured as described above, the cyclone type dust collecting part may be arranged substantially parallel to the connection pipe and on the side of the connection pipe opposite to the floor surface, with the opening part provided away from the connection pipe.

According to the present invention, in the vacuum cleaner structured as described above, the cyclone type dust collecting part may be arranged substantially parallel to the connection pipe, with part of the connection pipe bent so as to form a handle part to be held by a user during cleaning

Brief description of drawings

Fig. 1 is a diagram schematically showing the vacuum cleaner of a first embodiment of the invention.

Fig. 2 is a perspective view of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 3 is a sectional view, as seen from the side, of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 4 is a sectional view, as seen from above, of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 5 is a sectional view, as seen from above, of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention, showing its state with the valve open.

Fig. 6 is a diagram showing an example of the structure of the partition wall of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 7 is a diagram showing another example of the structure of the partition wall of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 8 is a diagram showing still another example of the structure of the partition wall of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the

invention.

Fig. 9 is a sectional view, as seen from the side, of the partition wall shown in Fig. 8.

Fig. 10 is a diagram illustrating the direction in which the cyclone dust collecting part is fitted in the vacuum cleaner of the first embodiment of the invention.

Figs. 11(a) and 11(b) are diagrams showing another example of the structure of the suction air guide of the vacuum cleaner of the first embodiment of the invention.

Fig. 12 is a diagram showing an example of the structure of the exhaust port of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 13 is a diagram showing another example of the structure of the exhaust port of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 14 is a diagram illustrating how the pressure sensor is fitted in the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention.

Fig. 15 is a diagram showing the first and second dust collecting chambers of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention, showing their detached state.

Fig. 16 is a diagram showing the first and second dust collecting chambers of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention, showing an example of their separated state.

Fig. 17 is a diagram showing the first and second dust collecting chambers of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention, showing another example of their separated state.

Fig. 18 is a diagram showing the second dust collecting chamber of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention, showing its

state with the lid open.

Fig. 19 is a diagram showing the first and second dust collecting chambers of the cyclone dust collecting part of the vacuum cleaner of the first embodiment of the invention, showing their state with the transparent member additionally provided.

Figs. 20(a), 20(b), and 20(c) are diagrams showing the exhaust port of the cyclone dust collecting part of the vacuum cleaner of a second embodiment of the invention.

Figs. 21(a) and 21(b) are diagrams illustrating the movement of the exhaust port of the cyclone dust collecting part of the vacuum cleaner of the second embodiment of the invention.

Fig. 22 is a perspective view of the cyclone dust collecting part of the vacuum cleaner of a third embodiment of the invention.

Fig. 23 is a perspective view of an example of the cyclone dust collecting part and the handle of the vacuum cleaner of a fourth embodiment of the invention.

Fig. 24 is a perspective view of another example of the cyclone dust collecting part of the vacuum cleaner of the fourth embodiment of the invention.

Fig. 25 is a diagram schematically showing the vacuum cleaner of a fifth embodiment of the invention.

Fig. 26 is a sectional view, as seen from the side, of the cyclone dust collecting part of a conventional vacuum cleaner.

Fig. 27 is a sectional view taken along A-A shown in Fig. 26.

Best mode for carrying out the invention

Hereinafter, embodiments of the present invention will be described with reference to the drawings. Fig. 1 is a diagram schematically showing the vacuum cleaner of a first embodiment. To a suction port body 4 having a suction port (not shown) facing the floor

surface F, a connection pipe 3 is connected, which is coupled to a cyclone dust collecting part 5.

The cyclone dust collecting part 5 communicates, through a coupling member 10 and a suction hose 2, with a body 1 of the vacuum cleaner having an electric blower 1a. Part of the coupling member 10 is bent so as to form a handle 10a to be held by the user. On the handle 10a is provided an operation part 10g, which has operation keys for various operations and a display for indicating the operation status.

When the electric blower 1a is driven, suction air is taken in through the suction port of the suction port body 4 as indicated by arrow f1. The suction air passes through the connection pipe 3 and flows into the cyclone dust collecting part 5 through an flow-in port 5a. Inside the cyclone dust collecting part 5, as the suction air flows in the form of a whiling stream, dust is separated and removed therefrom. The suction air is then discharged out of the body 1 of the vacuum cleaner by the suction force of the electric blower 1a as indicated by arrow f2.

The details of the cyclone dust collecting part 5 are shown in a perspective view in Fig. 2, a sectional view as seen from the side in Fig. 3, and a sectional view as seen from above in Fig. 4. The cyclone dust collecting part 5 has, in a top portion thereof, a suction air guide 20, in which the flow-in port 5a is formed. Thus, the cyclone dust collecting part 5 is coupled through the suction air guide 20 to the connection pipe 3. The cyclone dust collecting part 5 is formed substantially in a cylindrical shape, and is arranged parallel to the connection pipe 3. The flow of the suction air flowing into the cyclone dust collecting part 5 through the flow-in port 5a is substantially perpendicular to the flow of the suction air exhausted from the cyclone dust collecting part 5.

Moreover, the cyclone dust collecting part 5 is arranged on the side of the connection

pipe 3 opposite to the floor surface F (see Fig. 1). This makes it possible to lean the connection pipe 3 into a position in which it lies flat on the floor surface F when a narrow space such as the gap under a bed is cleaned, and in addition prevents the cyclone dust collecting part 5 from breaking and spreading dust about even when the cyclone dust collecting part 5 is dropped.

The suction air guide 20 is provided with a valve 13 made of an elastic material such as rubber. Under the vacuum pressure of the suction air, the valve 13 bends in the direction of the flow of the suction air. Thus, as shown in Fig. 5, the suction air flows into the cyclone dust collecting part 5 through the flow-in port 5a tangentially to the cyclone dust collecting part 5. As a result, as the suction air collides with an inner wall 5c of the cyclone dust collecting part 5 and is thereby formed into a whirling stream, dust is separated from the suction air and is collected in a first dust collecting chamber 7.

When the suction air is not flowing, the valve 13, by its own elasticity, closes the flow-in port 5a, and thereby prevents backflow of the dust. In this way, the dust collected is prevented from flowing back when, for example, the vacuum cleaner is stored away. The valve 13 may be formed out of a hard, plate-shaped member, in which case the valve 13 is loaded with a force that tends to cause it to close the flow-in port 5a by an elastic member such as a spring.

Under the first dust collecting chamber 7 is provided a second dust collecting chamber 8 substantially coaxially therewith, with a partition wall 9 placed in between. The partition wall 9 has a meshed opening part 9a having a large number of through holes as shown in Fig. 6. The mesh is formed out of a resin such as a nylon-based resin or a metal formed into a net, and is fixed to the partition wall 9 by double molding, by heat fusion, or with adhesive.

Fine particles of dust pass through the opening part 9a and are collected in the second

dust collecting chamber 8. The opening part 9a may be formed by molding the partition wall 9 in the shape of a grid, or by forming a large number of through holes therethrough that penetrate between the first and second dust collecting chambers 7 and 8.

As shown in Fig. 7, the opening part 9a may be provided in part of the partition wall 9. As shown in Figs. 8 and 9, a rib 11 having an adequate length may be formed so as to divide the second dust collecting chamber 8 into a portion 8a where the opening part 9a is provided and a portion 8b where the opening part 9a is not provided. This is preferable because it prevents backflow of the dust that has entered, over the rib 11, the portion 8b where the opening part 9a is not provided.

When the opening part 9a is formed in part of the partition wall 9 as shown in Figs. 7 and 8, it is preferable to arrange the opening part 9a away from the connection pipe 3 as shown in Fig. 10, because this prevents backflow of the dust collected in the second dust collecting chamber 8 when a high position such as the surface of a wall is cleaned.

As shown in Fig. 11(a), in the suction air guide 20 provided in the cyclone dust collecting part 5, sliding parts 20a and 20b may be formed so that the connection pipe 3 is held rotatably and hermetically. This makes the cyclone dust collecting part 5 rotatable about the connection pipe 3. That is, it is possible to retreat the cyclone dust collecting part 5 into the desired position according to the place to be cleaned, for example near a wall, in a narrow space, etc. This enhances the operability of the vacuum cleaner.

An opening 3b is formed in the connection pipe 3, and a suction air passage 20c is formed around the outside of the connection pipe 3. Thus, as shown in Fig. 11(b), irrespective of the positions of the opening 3b and the flow-in port 5a, the suction air is sucked into the cyclone dust collecting part 5 through the suction air passage 20c. The suction air guide 20 may be provided with a stopper that engages with the connection pipe 3

so as to restrict the rotation angle of the cyclone dust collecting part 5.

In Figs. 2 and 3 described earlier, a coupling pipe 10b, which is integral with the coupling member 10, has the end surface 10c thereof closed and is put into the cyclone dust collecting part 5. In the outer peripheral surface of the coupling pipe 10b, an exhaust port 5b, through which the suction air is exhausted from the cyclone dust collecting part 5, is formed in a position lower than the flow-in port 5a. As shown in Fig. 12, the exhaust port 5b is formed as mesh having a large number of through holes.

The mesh is formed out of a resin such as a nylon-based resin, and is fixed to the coupling pipe 10b by double molding, by heat fusion, or with adhesive in such a way as not to leave surface irregularities at the boundaries 10d and 10e. If there are surface irregularities there, dust is caught thereby and prompts clogging of the exhaust port 5b.

Alternatively, as shown in Fig. 13, the mesh may be formed into a lint tube 10f, which is then detachably fitted to the coupling pipe 10b by screw engagement, with a bayonet, with a clamp, or by another means. This is further preferable because it makes the repair and cleaning of the mesh easy.

The mesh of the exhaust port 5b is as fine as or finer than the mesh of the partition wall 9 so that the coarse particles of dust collected in the first dust collecting chamber 7 do not evade through the exhaust port 5b. Fine particles of dust are collected in the second dust collecting chamber 8, which is arranged outside the suction air passage away from the exhaust port 5b, and are thereby prevented from evading through the exhaust port 5b. The exhaust port 5b may be formed by molding the coupling pipe 10b or the lint tube 10f in the shape of a grid so as to form a large number of through holes that penetrate between the inside of the coupling pipe 10b and the first dust collecting chamber 7.

As shown in Fig. 14, a pressure sensor 15 for detecting the pressure difference

between inside the coupling pipe 10b and inside the first dust collecting chamber 7 may be provided. This makes it possible to detect the clogging of the exhaust port 5b. When the pressure sensor 15 detects a predetermined pressure difference, the electric blower 1a (see Fig. 1) is stopped, and the user is prompted to clean the exhaust port 5b. It is further preferable to provide a pressure difference warning means such as a lamp or an indicating means for giving a warning of the predetermined pressure difference on detection thereof. This makes it easier for the user to recognize the clogging of the exhaust port 5b.

In the cyclone dust collecting part 5 structured as described above, the suction air introduced through the flow-in port 5a passes through the first dust collecting chamber 7 in the form of a whirling stream, and meanwhile dust is separated therefrom. Fine particles of the dust pass through the opening part 9a and are collected in the second dust collecting chamber 8. Coarse particles are collected in the first dust collecting chamber 7. The suction air having dust removed therefrom passes through the first dust collecting chamber 7, and is then sucked through the exhaust port 5b into the electric blower 1a (see Fig. 1).

Thus, the suction air passage inside the cyclone dust collecting part 5 consists of the flow-in port 5a, the first dust collecting chamber 7, and the exhaust port 5b. That is, the first dust collecting chamber 7 for accommodating dust is arranged within the suction air passage. This helps miniaturize the cyclone dust collecting part 5. On the other hand, the second dust collecting chamber 8 is arranged outside the suction air passage. This prevents the fine particles of dust that are collected in the second dust collecting chamber 8 from flowing back into the suction air passage and evading through the cyclone dust collecting part 5.

Moreover, as shown in Fig. 15, the cyclone dust collecting part 5 is so structured that the first and second dust collecting chambers 7 and 8 are integrally detachable by means of a coupling part 5e realized by screw engagement, with a bayonet, with a clamp, or by another

means. As shown in Fig. 16 or 17, the first and second dust collecting chambers 7 and 8 are further separable by means of a coupling part 5f realized by screw engagement, with a bayonet, with a clamp, or by another means. Furthermore, as shown in Fig. 18, the second dust collecting chamber 8 may be so structured that a lid 8c at its lid is openable by means of a coupling part 5h realized by screw engagement, with a bayonet, with a clamp, or by another means.

Thus, since fine particles of dust are collected in the second dust collecting chamber 8, it is possible to detach the first and second dust collecting chambers 7 and 8 integrally from the vacuum cleaner, and then separate the first and second dust collecting chambers 7 and 8 from each other above a trash can or the like. This makes it easy to move the vacuum cleaner around, and also helps prevent fine particles of dust from rising and making the surroundings dirty. Moreover, it is easy to perform cleaning using water or the like. Furthermore, the openable lid 8c makes the disposal of refuse easier.

In Fig. 15, the coupling member 10 and the coupling pipe 10b, and the coupling pipe 10b and the suction air guide 20, are detachably coupled together by means of a taper-taper joint. Alternatively, as shown in Fig. 16, the coupling pipe 10b and the suction air guide 20 may be formed integrally.

As shown in Fig. 19, part or the whole of the first and second dust collecting chambers 7 and 8 may be formed out of a transparent or semitransparent member 12a and 12b. This permits the amount of dust collected in the first and second dust collecting chambers 7 and 8 to be visually checked, and thus makes it easier to recognize when to dispose of refuse. It is preferable to form the transparent members 12a and 12b out of glass, because then they are resistant to scratches and continue to offer good viewability for an extended period.

Figs. 20(a), 20(b), and 20(c) are a sectional view as seen from above, a sectional view

as seen from the side, and a side view of the exhaust port 5b of the cyclone dust collecting part 5 of the vacuum cleaner of a second embodiment.. In other respects, the structure here is the same as in the first embodiment. In this embodiment, the coupling pipe 10b has its end surface 10f open, and functions as an outer cylinder into which an inner cylinder 16 is slidably fitted.

Inside the coupling pipe 10b, a cross-shaped spring support 10h is formed. Between the spring support 10h and the bottom surface 16a of the inner cylinder 16, a compressed spring 17 is provided that loads the inner cylinder 16 with a force that tends to press it downward. In the outer peripheral surface of the inner cylinder 16 is provided an exhaust port 5b similar to that shown in Fig. 12.

The suction air flows through the exhaust port 5b into the inner cylinder 16 as indicated by arrow B, and is sucked through the coupling pipe 10b into the electric blower 1a (see Fig. 1). As shown in Fig. 21(a), when refuse 19 attaches to and clogs the exhaust port 5b, the vacuum pressure of the electric blower 1a sucks the inner cylinder 16 in as indicated by arrow C. As a result, as shown in Fig. 21(b), the inner cylinder 16 retracts into the coupling pipe 10b (outer cylinder), and the exhaust port 5b is covered by the coupling pipe 10b. Meanwhile, the end surface 10f of the coupling pipe 10b scrapes the refuse 19 off.

Inside the inner cylinder 16, a switch member (not shown) for detecting the movement of the inner cylinder 16 is provided. When the inner cylinder 16 moves, it turns the switch member on so that a warning is given of the clogging of the exhaust port 5b by a clogging warning means such as by lighting an LED or displaying an indication on a liquid crystal display panel.

Warned of the clogging of the exhaust port 5b by the clogging warning means, the user stops the electric blower 1a and cleans the exhaust port 5b. Since the refuse 19 is

scraped off by the movement of the inner cylinder 16, it is also possible to stop the electric blower 1a temporarily as soon as the switch member is turned on, so that the exhaust port 5b is exposed by the resilience of the compressed spring 17, and then immediately restart the electric blower 1a.

As in Fig. 14 described earlier, a pressure sensor 15 may be provided between the coupling pipe 10b and the first dust collecting chamber 7. When the exhaust port 5b is clogged and the inner cylinder 16 retracts into the coupling pipe 10b, the pressure sensor 15 detects a predetermined pressure difference. Here, it is also possible to stop the electric blower 1a (see Fig. 1) and then restart it a predetermined time thereafter.

Now, the exhaust port 5b has been cleaned as a result of the refuse 19 attached to the exhaust port 5b being scraped off by the end surface 10f of the coupling pipe 10b, and the inner cylinder 16 has returned to its original position under the resilience of the compressed spring 17 as a result of the electric blower 1a being stopped. Thus, it is possible to restart the electric blower 1a. If the restarting of the electric blower 1a is attempted several times within a predetermined time and nevertheless the pressure difference does not drop, the exhaust port 5b may be recognized as insufficiently cleaned so that the electric blower 1a is stopped but not restarted.

Fig. 22 is a perspective view of the cyclone dust collecting part 5 of the vacuum cleaner of a third embodiment. For convenience's sake, such members as find their counterparts in the first embodiment shown in Fig. 2 are identified with the same reference numerals. In other respects, the structure here is the same as in the first embodiment. In this embodiment, the cyclone dust collecting part 5 is arranged substantially parallel to the connection pipe 3, and the connection pipe 3 is bent and coupled to the cyclone dust collecting part 5. The bent portion functions as a handle 3a that is held by the user during

cleaning.

With this structure, not only the same effects as in the first and second embodiments are achieved, but it is also possible to reduce the space occupied by the handle 10a (see Fig. 1). Thus, it is possible to miniaturize the vacuum cleaner and enhance the operability thereof.

Fig. 23 is a perspective view of the cyclone dust collecting part 5 and the handle portion of the vacuum cleaner of a fourth embodiment. For convenience's sake, such members as find their counterparts in the first embodiment shown in Fig. 2 are identified with the same reference numerals. In other respects, the structure here is the same as in the first embodiment. In this embodiment, the handle 10a held by the user is formed integrally with the suction air guide 20 of the cyclone dust collecting part 5.

Moreover, the coupling pipe 10b put into the cyclone dust collecting part 5 is connected, through a coupling part 10, to a suction hose 2 (see Fig. 1) so that the suction air is introduced into the electric blower 1a. In the vacuum cleaner structured in this way also, it is possible to structure the cyclone dust collecting part 5 in the same manner as in the first and second embodiments, and thereby achieve the same effects. As shown in Fig. 24, the coupling pipe 10b and the suction air guide 20 may be formed integrally.

Fig. 25 is a diagram schematically showing the vacuum cleaner of a fifth embodiment. For convenience's sake, such members as find their counterparts in the first embodiment shown in Fig. 2 are identified with the same reference numerals. In this embodiment, the coupling pipe 10b coupled to the cyclone dust collecting part 5 is directly coupled to the body 1; that is, the vacuum cleaner as a whole is structured as a vacuum cleaner of a so-called upright type. The handle 10a held by the user during cleaning is formed integrally with the body 1. In the vacuum cleaner structured in this way also, it is possible to structure the cyclone dust collecting part 5 in the same manner as in the first and second embodiments, and

thereby achieve the same effects.

Industrial applicability

As described above, according to the present invention, by arranging a dust collecting chamber for collecting dust within a suction air passage, it is possible to miniaturize a cyclone dust collecting part and thereby enhance the operability of a vacuum cleaner.

Moreover, according to the present invention, by arranging a first and a second dust collecting chamber inside a cyclone dust collecting part with a partition wall, having mesh or the like, placed between them, it is possible to separate dust according to particle size or weight. This makes it possible to prevent fine particles of dust from being exposed on a surface when the first dust collecting chamber is detached from the cyclone dust collecting part. Thus, it is possible to prevent fine particles of dust from rising when refuse is disposed of.

Moreover, according to the present invention, arranging a first dust collecting chamber inside a suction air passage helps miniaturize a cyclone dust collecting part, and arranging a second dust collecting chamber outside helps prevent the dust collected in the second dust collecting chamber from flowing back into the suction air passage and evading through an exhaust port.

Moreover, according to the present invention, a first and a second dust collecting chamber can be detached integrally, and the first and second dust collecting chambers can be separated from each other above a trash can or the like. This makes it easy to move around a vacuum cleaner, and in addition helps prevent the fine particles of dust collected in the second dust collecting chamber from rising up and making the surroundings dirty. Moreover, it is easy to perform cleaning using water or the like. Moreover, by forming part or the whole of

the first and second dust collecting chambers out of a transparent member, it is possible to visually check the amount of dust. This makes it easy to recognize when to dispose of refuse.

Moreover, according to the present invention, a valve is provided that closes an flow-in port when suction air is not flowing. This prevents backflow and release of dust through a connection pipe as when a vacuum cleaner is stored away.

Moreover, according to the present invention, a pressure sensor that detects the pressure difference between on the upstream and downstream sides of an exhaust port of a cyclones dust collecting part, or an inner cylinder that is slidable under the suction force of an electric blower is provided. This makes it easy to detect clogging of the exhaust port.

Moreover, according to the present invention, when an opening part is formed in part of a partition wall, the opening part is arranged on the side of a connection pipe opposite to a floor surface. This prevents backflow of dust through the opening part when a high position such as the surface of a wall is cleaned, and thus helps enhance the operability of a vacuum cleaner.

Moreover, according to the present invention, a connection pipe is bent so as to function as a handle held by the user during cl. This helps reduce the space occupied by the handle. In this way, it is possible to miniaturize a vacuum cleaner and enhance the operability thereof.

CLAIMS

1. (Amended) A vacuum cleaner comprising a suction port body having a suction port, an electric blower for generating suction air, a connection pipe connected to the suction port body, and a cyclone type dust collecting part, disposed between the suction port body and the electric blower, for separating dust by forming the introduced suction air into a whirling stream and collecting the separated dust in a dust collecting chamber arranged in a suction air passage,

wherein a suction air guide is provided that comprises a cylindrical portion substantially cylindrical in shape which is fitted on a top portion of the dust collecting chamber and which has an exhaust portion formed so as to protrude from a center of a ceiling surface thereof into the dust collecting chamber, a connoting portion that is connected to the connection pipe, and a flow-in portion that couples the cylindrical portion and the connecting portion together so as to permit dust to be introduced tangentially to the dust collecting chamber.

2. (Amended) A vacuum cleaner as claimed in claim 1,

wherein the exhaust portion is arranged substantially perpendicularly to the flow-in portion, and a filter is provided in an exhaust port formed in a peripheral surface of the exhaust portion.

3. (Amended) A vacuum cleaner as claimed in claim 1,

wherein the cyclone type dust collecting part is arranged substantially parallel to the connection pipe, and part of the connection pipe is bent so as to form a handle part that runs along a peripheral surface of the cyclone type dust collecting part with a gap secured in

between that permits insertion of fingers of a user.

4. A vacuum cleaner as claimed in claim 1,

wherein the electric blower and the cyclone type dust collecting part are so arranged as to communicate with each other through a flexible communicating pipe.

5. (Amended) A vacuum cleaner comprising a suction port body having a suction port, an electric blower for generating suction air, a connection pipe connected to the suction port body, and a cyclone type dust collecting part, disposed between the suction port body and the electric blower, for forming the suction air introduced through a flow-in port into a whirling stream so as to separate dust and then discharging the suction air through an exhaust port,

wherein the cyclone type dust collecting part has a first dust collecting chamber and a second dust collecting chamber, both cylindrical in shape, for accommodating the separated dust, the first and second dust collecting chambers being arranged side by side along an axis thereof and separated from each other by a partition wall having an opening part formed therein, and

a suction air guide is provided that comprises a cylindrical portion substantially cylindrical in shape which is fitted on a top portion of the first dust collecting chamber and which has an exhaust portion formed so as to protrude from a center of a ceiling surface thereof into the first dust collecting chamber, a connoting portion that is connected to the connection pipe, and a flow-in portion that couples the cylindrical portion and the connecting portion together so as to permit dust to be introduced tangentially to the first dust collecting chamber.

6. A vacuum cleaner as claimed in claim 5,

wherein the first dust collecting chamber is arranged within a suction air passage of the cyclone type dust collecting part, and the second dust collecting chamber is arranged outside the suction air passage of the cyclone type dust collecting part.

7. A vacuum cleaner as claimed in claim 5,

wherein the first and second dust collecting chambers are arranged so as to be detachable from the cyclone type dust collecting part.

8. A vacuum cleaner as claimed in claim 5,

wherein at least part of the first and second dust collecting chambers is formed out of a transparent member that permits an inside to be viewed from outside.

9. A vacuum cleaner as claimed in claim 5,

wherein a valve for closing the flow-in port when the electric blower is at rest is provided.

10. (Amended) A vacuum cleaner as claimed in claim 5,

wherein the exhaust portion is arranged substantially perpendicularly to the flow-in portion, and a filter is provided in the exhaust port formed in a peripheral surface of the exhaust portion.

11. A vacuum cleaner as claimed in claim 5,

wherein the exhaust port is provided in a cylindrical surface of an inner cylinder that is slidable inside an outer cylinder that is provided so as to protrude into the first dust collecting chamber, and, when the exhaust port is clogged, the exhaust port is covered by the outer cylinder under a suction force of the electric blower.

12. A vacuum cleaner as claimed in claim 5,

wherein a pressure sensor for detecting a pressure difference between in a suction air passage of the cyclone type dust collecting part and in an exhaust passage for the suction air exhausted through the exhaust port is provided.

13. A vacuum cleaner as claimed in claim 5,

wherein the cyclone type dust collecting part is arranged substantially parallel to the connection pipe and on a side of the connection pipe opposite to a floor surface, and the opening part is provided away from the connection pipe.

14. A vacuum cleaner as claimed in claim 5,

wherein the cyclone type dust collecting part is arranged substantially parallel to the connection pipe, and part of the connection pipe is bent so as to form a handle part to be held by a user during cleaning

15. A vacuum cleaner as claimed in claim 5,

wherein the electric blower and the cyclone type dust collecting part are so arranged as to communicate with each other through a flexible communicating pipe.

ABSTRACT

A vacuum cleaner, comprising a suction port body having a suction port, an electric blower generating suction air, a connection pipe connected to the suction port body, and a cyclone type dust collecting part which is disposed between the suction port body and the electric blower and exhausts suction air from an exhaust port after the suction air flowed in from a flow-in port is swirled so as to separate dust and dirt, wherein a first dust collecting chamber and a second dust collecting chamber storing the separated dust and dirt are provided coaxially with each other through a partition wall having an opening part, whereby a cyclone dust collecting part can be reduced in size, controllability for refuse disposal can be increased, and the electric blower can be prevented from being damaged.

FIG. 1

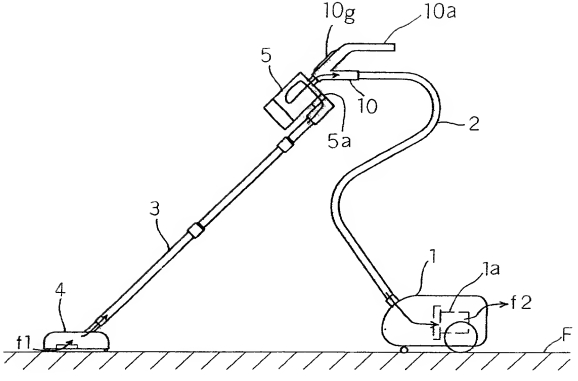


FIG. 2

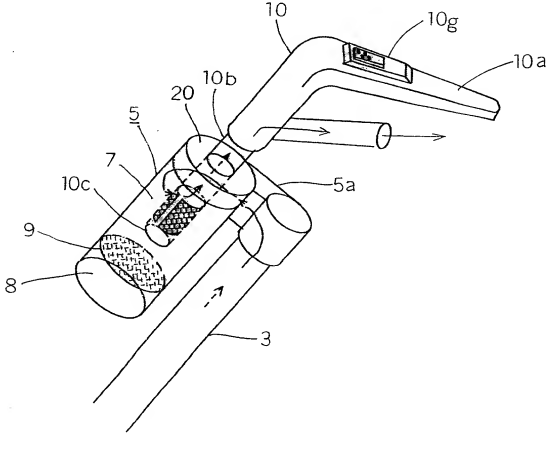


FIG. 3

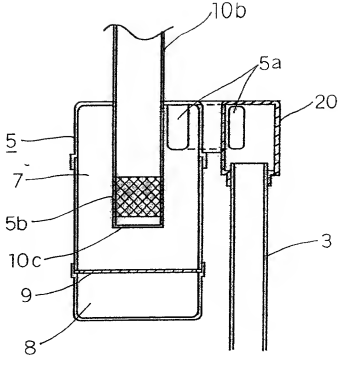


FIG. 4

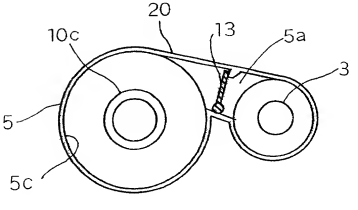


FIG. 5

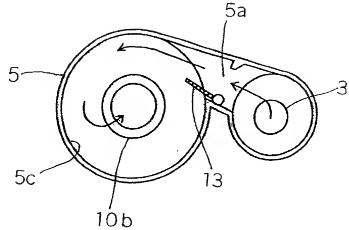


FIG. 6

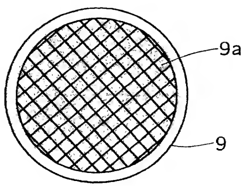


FIG. 7

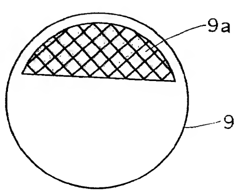


FIG. 8

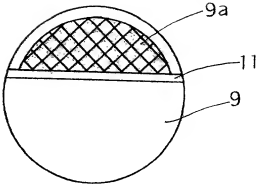


FIG. 9

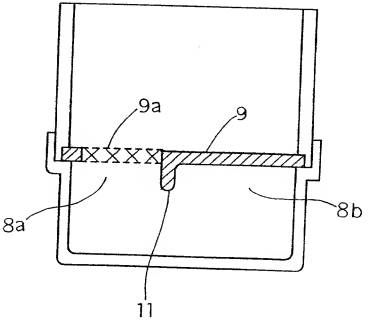


FIG. 10

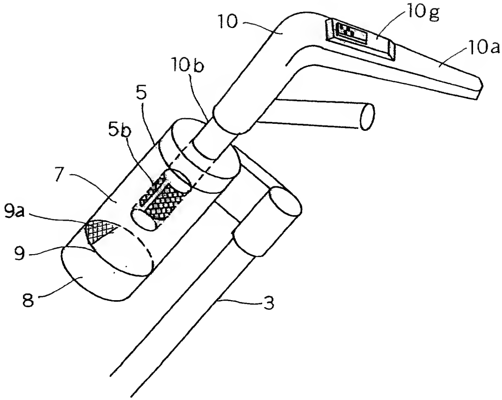


FIG. 11(a)

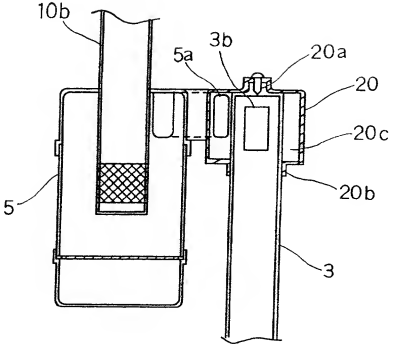


FIG. 11(b)

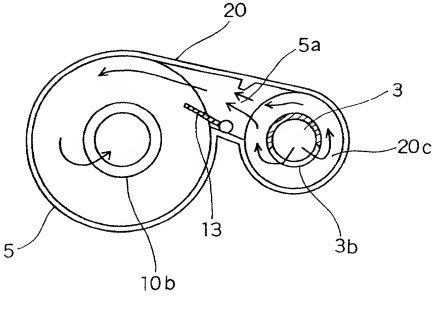


FIG. 12

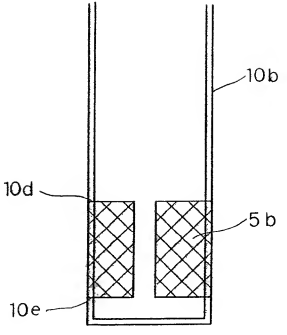


FIG. 13

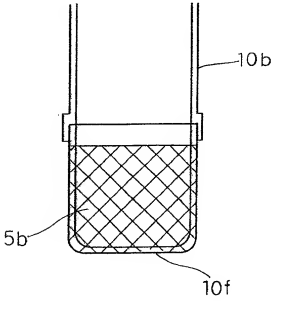


FIG. 14

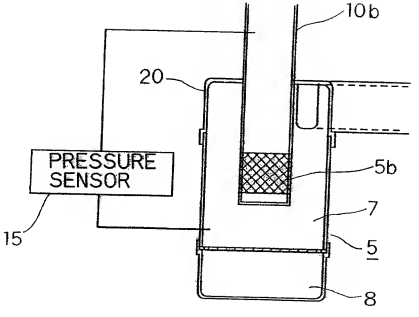


FIG. 15

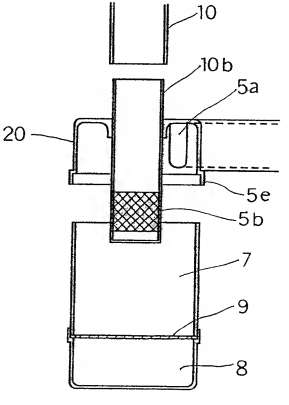


FIG. 16

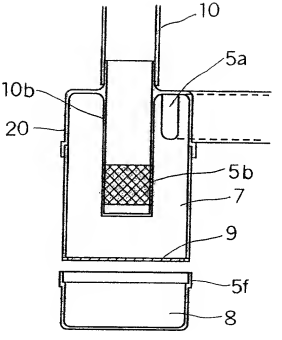


FIG. 17

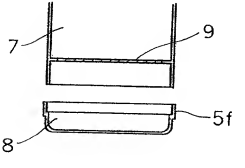


FIG. 18

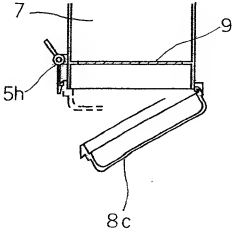


FIG. 19

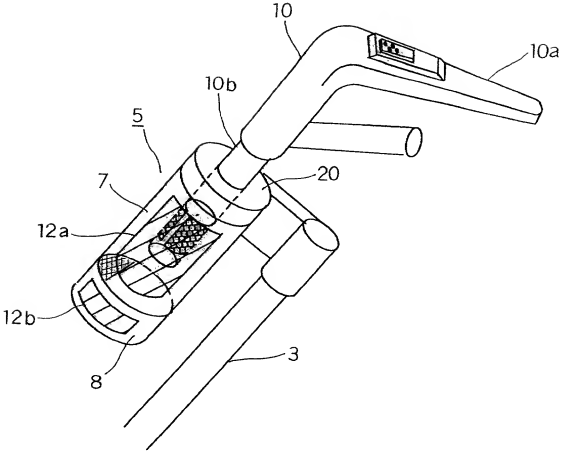


FIG. 20(a)

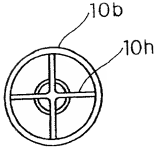


FIG. 20(b)

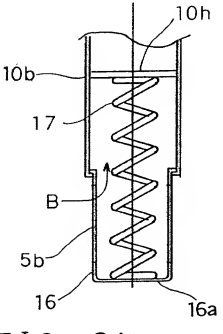


FIG. 20(c)

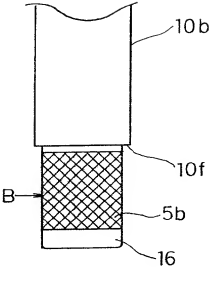


FIG. 21(a)

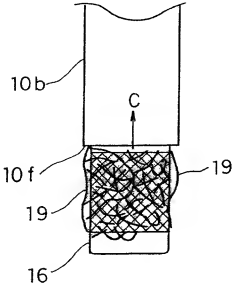


FIG. 21(b)

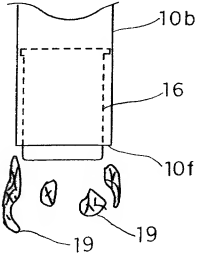


FIG. 22

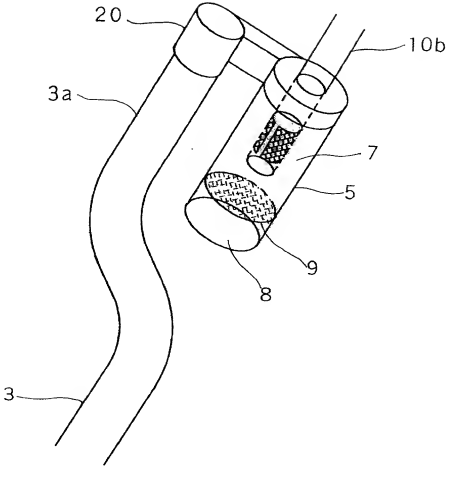


FIG. 23

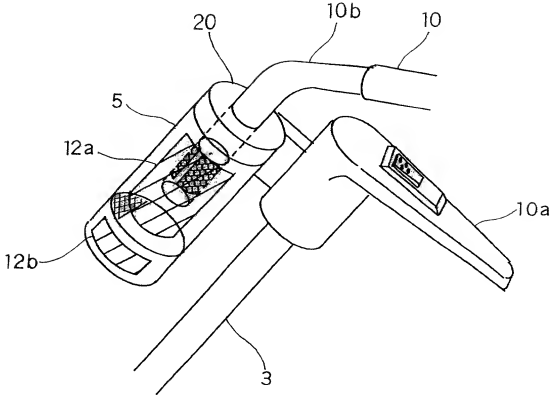


FIG. 24

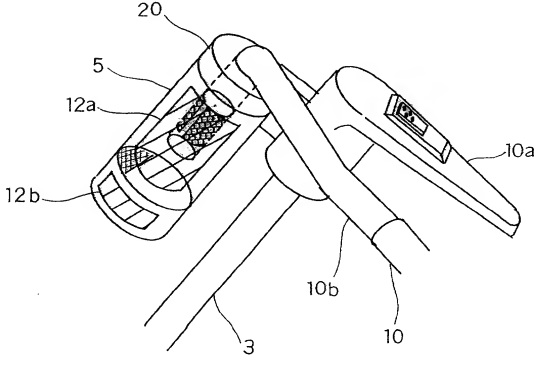


FIG. 25

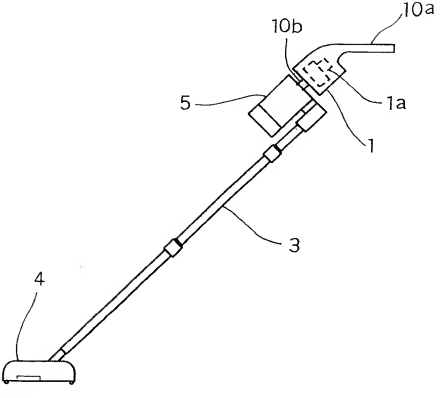


FIG. 26

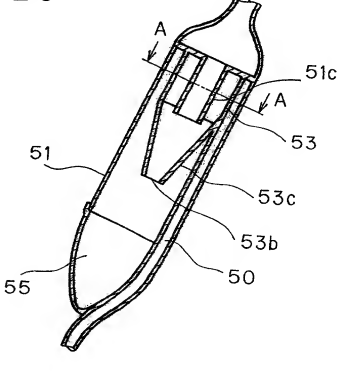
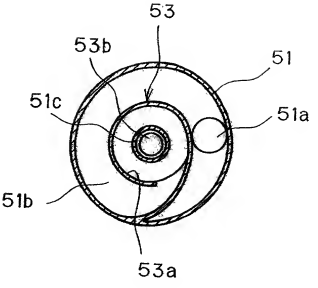


FIG. 27



2936-0145P
Attorney Docket No.

PLEASE NOTE: YOU MUST COMPLETE THE FOLLOWING

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COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT AND DESIGN APPLICATIONS

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert Title: VACUUM CLEANER

Fill in Appropriate Information - For Use Without Specification Attached:

the specification of which is attached hereto. If not attached hereto,
the specification was filed on _____ as
United States Application Number _____ ;
and amended on _____ (if applicable) and/or
the specification was filed on July 17, 2000 as PCT
International Application Number PCT/JP00/04804 ; and was
amended under PCT Article 19 on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Insert Priority Information: (if appropriate)

Prior Foreign Application(s)			Priority Claimed	
H11-204524 (Number)	JAPAN (Country)	July 19, 1999 (Month/Day/Year Filed)	☒ Yes	☐ No
(Number)	(Country)	(Month/Day/Year Filed)	☐ Yes	☐ No
(Number)	(Country)	(Month/Day/Year Filed)	☐ Yes	☐ No
(Number)	(Country)	(Month/Day/Year Filed)	☐ Yes	☐ No

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional applications(s) listed below

Insert Provisional Application(s): (if any)

(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

Insert Requested Information: (if appropriate)

Country	Application Number	Date of Filing (Month/Day/Year)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States and/or PCT application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States and/or PCT application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Insert Prior U.S. Application(s): (if any)

(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)
(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)

2936-0145P
Attorney Docket No.

I hereby appoint the practitioners at **CUSTOMER NO. 2292** as my attorneys or agents to prosecute this application and/or an international application based on this application and to transact all business in the United States Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the practitioners, unless the inventor(s) or assignee provides said practitioners with a written notice to the contrary.

Send Correspondence to:

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PLEASE NOTE: YOU MUST COMPLETE THE FOLLOWING:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First or Sole Inventor: Insert Name of inventor
Insert Date This Document is Signed

Insert Residence
Insert Citizenship

Insert Post Office Address

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Full Name of Third Inventor, if any: see above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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MAILING ADDRESS (Complete Street Address including City, State & Country)		
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Full Name of Fourth Inventor, if any: see above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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Full Name of Fifth Inventor, if any: see above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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MAILING ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Sixth Inventor, if any: see above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
MAILING ADDRESS (Complete Street Address including City, State & Country)		

*DATE OF SIGNATURE